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NOTES ON TRIFOLIUM ERIOCEPHALUM NUTTALL

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During a recent taxonomic study of the native clovers of the United States, several nomenclatural ambiguities were discovered. Two varieties of *Trifolium eriocephalum* Nuttall long have been known under invalid names and the distinctions between the several varieties never have been very clear-cut. The species and its four varieties are revised here in an attempt to correct these difficulties. Herbarium material from the following institutions has been studied: University of California, Berkeley, California; Dudley Herbarium, Stanford University, California; Gray Herbarium, Harvard University, Cambridge, Massachusetts; New York Botanical Garden, New York, New York; Pomona College, Claremont, California; Philadelphia Academy of Sciences, Philadelphia, Pennsylvania; Utah State Agricultural College, Logan, Utah; University of Washington, Seattle, Washington. I am deeply grateful to the curators of these herbaria for the loan of their material.

TRIFOLIUM ERIOCEPHALUM Nutt. in Torrey and Gray, Fl. N. Am. 1: 313. 1838.

Usually villous or rarely glabrous perennials; stems branching from apex of thick, deep root, erect or spreading, 5-45 cm. tall, 1-3 mm. in diameter; leaflets always 3, varying in shape; inflorescence 25-85-flowered, 15-30 mm. in diameter, without an involucre, the pedicels less than 0.8 mm. long, the entire inflorescence often horizontal or sometimes inverted because of the bending of the peduncle just beneath the head; flowers yellowish, pink, purplish or ochroleucus, 8-16 mm. long, sharply reflexed, the curvature sharp near the base; calyx somewhat shorter than the banner, the tube 1-3 mm. long, membranous, strongly 10(9-11)-veined, teeth slenderly subulate, sharp but not spine-tipped, often curved and twisted, usually villous with long diverging hairs 0.7-2.5 mm. long, the lower teeth 2-5 times as long as the tube, the upper teeth subequal to or shorter than the lower; banner ovate, oblong,

or elliptical, the apex rounded (rarely acute), apiculate or slightly retuse, adnate to the claws of the wings for 0.7–2 mm. at the base; wings from equal to 2 mm. shorter than the banner, the blades usually much shorter than the claws, blunt or shortly acute; keel equal to 1 mm. shorter than the wings, the blades much shorter than the claws, boat-shaped, sometimes slightly rostrate; legume sessile, small, densely villous especially towards the apex (rarely glabrous), membranous, often nearly veinless, 2–7-ovuled, 1–4-seeded; seeds smooth, 1.5–3 mm. long.

KEY TO VARIETIES

Ovaries mostly with more than two ovules (usually 4-ovuled).

Leaflets of at least the basal leaves broad and rounded, rarely retuse; upper leaves with elliptical or oblong, rounded or acute leaflets, but never linear and acuminate.

Basal leaves glabrous; northeastern Oregon and adjacent Washington and Idaho

b. *T. eriocephalum*
var. *Piperi*

All leaves noticeably villous; Utah

d. *T. eriocephalum*
var. *villiferum*

All leaflets narrow, linear, acuminate, rarely acute

c. *T. eriocephalum*
var. *Cusickii*

Ovaries 2-ovuled, rarely a few ovaries with 3 ovules

a. *T. eriocephalum*
var. *typicum*

a. *T. ERIOCEPHALUM* Nutt. var. **typicum** nom. nov. *T. eriocephalum* Nutt. in Torrey and Gray, Fl. N. Amer. 1: 313. 1838. *T. scorpioides* Blasdale, Erythea 4: 187. 1896; type, along Mad River, Humboldt County, California, June 8, 1896, *W. C. Blasdale* (Herb. Univ. Calif.). *T. arcuatum* Piper, Bull. Torrey Bot. Club 28: 39. 1901, as to type only, other specimens cited and other material identified as such by Piper belong in the variety *Piperi*; type, Simcoe Mountains, Klickitat County, Washington, June 6, 1884, *W. N. Suksdorf 270* (Gray Herb.). *T. eriocephalum* Nutt. f. *arcuatum* (Piper) McDermott, N. Am. Species Trifolium 231. 1910, as to name only, not material cited. *T. eriocephalum* Nutt. var. *arcuatum* (Piper) McDerm. *apud* Peck, Man. Higher Plants of Oregon 429. 1941. *T. eriocephalum* Nutt. var. *Butleri* Jepson, Fl. Calif. 2: 302. 1936; type, Log Lake, Shackleford Creek, Siskiyou County, California, August 3, 1908, *G. D. Butler 384* (isotype, Herb. Univ. Calif.).

Leaflets mostly elliptical or oblong, acute to narrowly rounded and often apiculate at the apex, 4–12 mm. wide, 20–50 mm. long, densely villous on both sides, rarely glabrous; calyx one-half to three-fourths as long as the banner; legume densely villous towards the apex, rarely nearly glabrous, 2-ovuled, rarely a few ovaries with 3 ovules, 1(2)-seeded. Flowering from early May to July.

Type. Prairies of the Wahlamet [Willamette], Oregon, *T. Nuttall* (Herb. N. Y. Bot. Gard.).

Distribution. From Klickitat County, Washington, to Mendocino County, California; foothills and lower mountain slopes, 2000 to 7000 feet elevation.

Representative material. *W. C. Cusick* 2811a; *H. M. Hall* 4076; *A. A. Heller* 10047, 13636; *L. F. Henderson* 36, 196, 3095, 12330, 12341; *J. W. Thompson* 710, 4284, 4377, 4675, 10195, 13081; *J. P. Tracy* 2641, 2759, 5834, 7729, 8728, 8769, 8770, 8821, 8835.

A discussion of *T. arcuatum* is given under var. *Piperi*. The variety *Butleri* of Jepson includes some of the smaller specimens of the typical variety occurring in northern California. A part of the type collection and Jepson's other cited specimen (*Chandler* 1712) are reduced in size but otherwise not different. In Humboldt County, California, a few plants have been collected which are nearly glabrous but do not otherwise differ from other specimens in the same region. All gradations from nearly glabrous to densely villous are found and consequently no recognition is given these plants.

b. *T. ERIOCEPHALUM* Nutt. var. *Piperi* var. nov. *T. arcuatum* Piper, Bull. Torrey Bot. Club 28: 39. 1901, as to material cited except for the type.

Caules villosi vel glabrati, 5–30 cm. longi, 1–3 mm. lati. Foliolae foliorum superiorum ovatae vel ellipticae vel oblongae, apicibus rotundis vel acutis, glabratae vel aliquantae villosae, 4–13 mm. latae, 20–40 mm. longae; foliolae foliorum inferiorum latae et breves, saepe obovatae et retusae, integerrimae; stipulae superiores 15–30 mm. longae, lanceolatae vel ovatae. Flores 12–15 mm. longi, petalis flavis vel puniceis pallidis vel albis (?); calycibus $\frac{2}{3}$ – $\frac{3}{4}$ longitudinum vexillorum, fistulis calycum 1.5–2.7 mm. longis; dentibus inferioribus 5–8.5 mm. longis, 3–4 longitudinum fistularum, subglabratis vel aliquantis villosis. Legumina ad apicis villosa aliquanta 4–5 (3–7)-ovulatis, 1–3-seminibus.

Leaflets of the upper leaves ovate, elliptical or oblong, rounded or acute at the apices, glabrous or moderately villous, 4–13 mm. wide, 20–40 mm. long; leaflets of the basal leaves broader and shorter, often obovate and retuse, entire; calyx two-thirds to three-fourths as long as the banner; legume moderately villous at the apex, 4–5 (3–7)-ovuled, 1–3-seeded. Flowering in June and July.

Type. Paradise, Wallowa County, Oregon, June 12, 1900, *W. C. Cusick* 2405 (Gray Herbarium; isotypes, Herb. Univ. Calif., N. Y. Bot. Gard., Pomona College, Univ. Wash.).

Distribution. Northeastern Oregon and adjacent Washington and Idaho; moist mountain meadows and woods, 3500 to 6500 feet elevation.

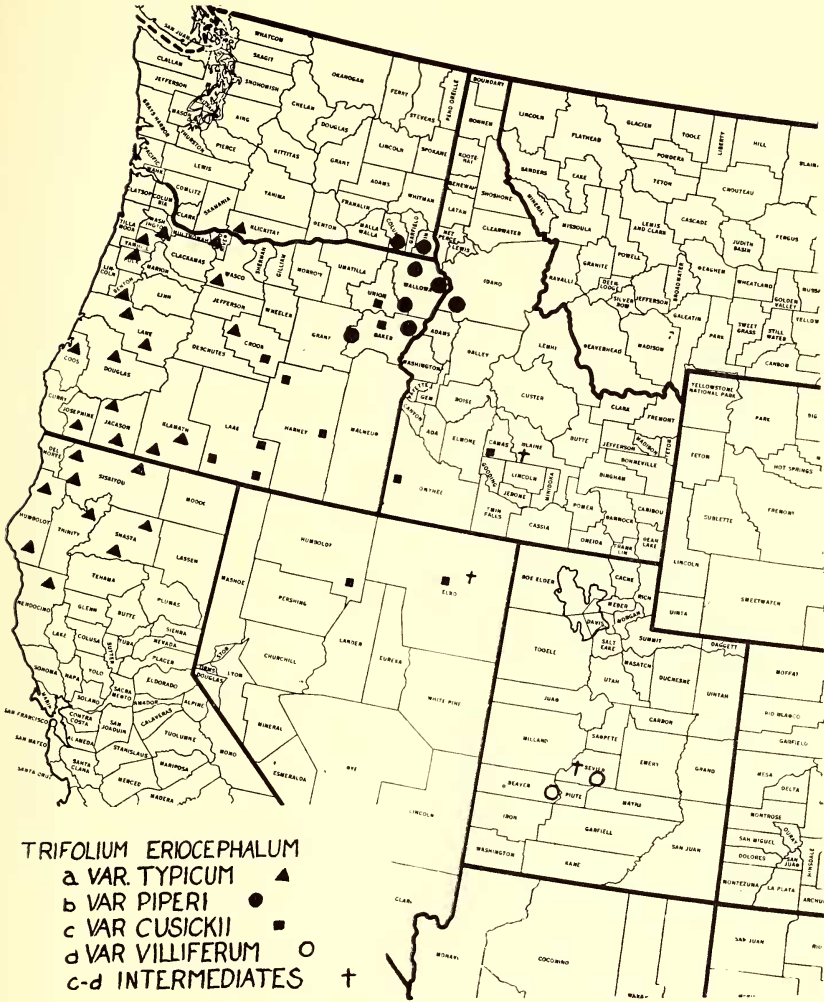


FIG. 1. Distribution of *Trifolium eriocephalum*.

Representative material. *W. C. Cusick* 943, 2432, 2797, 3258d; *R. Ferris* 1158; *L. F. Henderson* 5386; *G. N. Jones* 1877; *M. E. Peck* 17544, 17993.

This variety is distinguished easily from the typical variety by the more numerous ovules. Two-ovuled pods are found occasionally but the majority of the ovaries on any plant have more than two. A very few plants are intermediate in this respect, having a rather large number of 2-ovuled pods (*Cusick* 2797; *Peck* 17993). From var. *villiferum*, var. *Piperi* is distinguished less

clearly. The var. *Piperi* has broad, glabrous basal leaflets while var. *villiferum* has narrower leaflets all of which are villous. Since var. *Cusickii* has the leaflets all narrow with slender apices, it is distinguishable from var. *Piperi* although in some cases the upper leaflets of the two varieties may be rather similar.

The plants included here have long been known as *T. arcuatum* Piper or as f. *arcuatum*. In his original description Piper cited a type and four other specimens. I have examined three of these and they are var. *Piperi*, but Piper's type specimen is a two-ovuled plant belonging with the typical variety. It is therefore necessary to redescribe the entity as a new variety.

c. *T. ERIOCEPHALUM* Nutt. var. **Cusickii** (Piper) comb. nov. *T. arcuatum* Piper var. *Cusickii* Piper, Bull. Torrey Bot. Club 29: 641. 1902. *T. harneyense* Howell, Fl. N. W. Am. 1: 134. 1897; type, Harney Valley, Oregon, 1887, *T. Howell*. *T. arcuatum* Piper var. *harneyense* (Howell) McDerm. N. Am. Species Trifolium 231. 1910. *T. tropicum* Nelson, Bot. Gaz. 54: 409. 1912; type, Jordan Valley, Owyhee County, Idaho, June 22, 1911, *J. F. Macbride 967* (isotypes, Gray Herb.).

Leaflets all linear or very narrowly lanceolate, 2–6 mm. wide, 30–75 mm. long, with slender acuminate apices, glabrous or more often villous, especially along the midveins, often folded and falcate; calyx one-third to one-half as long as the banner; legume sparingly to densely villous towards the apex, 4–5-ovuled, 1–3-seeded. Flowering in June and July.

Type. Camp Creek, Maureys Mountains, Oregon, July 2, 1901, *W. C. Cusick 2628* (isotypes, Univ. Calif., Gray Herb.).

Distribution. Eastern Oregon, northeastern Nevada, and adjacent Idaho; in moist meadows and open woodland, 4000 to 7000 (?) feet elevation.

Representative material. *E. I. Applegate 7724, 7754*; *C. C. Bruce 2290*; *L. Constance (Henderson 9646)*; *W. C. Cusick 1659a, 2049, 2075a*; *A. A. Heller 9032*; *M. E. Peck 2327, 10375, 13895*; *J. W. Thompson 12058*.

McDermott called this entity f. *harneyense*, basing her usage on Piper's reduction of *harneyense* to a variety under *arcuatum*. She gives the date for this change as 1901 but does not cite the publication by name. I suspect that the combination actually never had been made and therefore *Cusickii* is the earliest valid varietal name.

d. *T. ERIOCEPHALUM* Nutt. var. **villiferum** (House) comb. nov. *T. villiferum* House, Bot. Gaz. 41: 335. 1906. *T. eriocephalum* Nutt. f. *villiferum* (House) McDerm. N. Am. Species Trifolium 242. 1910.

Leaflets elliptical or oblong, rounded, more rarely acute, 7–13 mm. wide, 30–50 mm. long, all leaflets moderately to densely

villous on both sides; calyx one-half or less the length of the banner; legume villous, 4-ovuled, 1-2-seeded. Flowering in June and July.

Type. Beaver City, Beaver County, Utah, 1877, *E. Palmer 91* (isotype, N. Y. Bot. Gard.).

Distribution. South central Utah, 6000 to 7000 (?) feet elevation.

Representative material. Deep Creek, June 6, 1891, *M. E. Jones*; Ibapah, June 22, 1891, *M. E. Jones*.

A number of collections show characters intermediate between the varieties *Piperi* and *Cusickii*, from which this variety is distinguished mainly by the possession of broad, always villous leaflets. The range of the available specimens is so far removed from those of the other varieties that I recognize the variety with less basis than usual. In some ways var. *villiferum* is intermediate between var. *Cusickii* and var. *Piperi*.

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PINUS: THE FERTILE SPECIES HYBRID BETWEEN KNOBCONE AND MONTEREY PINES

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Fresh pollen collected from Monterey pine (*Pinus radiata* Don) growing a few feet above sea level near Monterey, California, was applied in April, 1927, to receptive conelets of the Sierra foothill form of knobcone pine (*Pinus attenuata* Lemmon) growing at an altitude of 3000 feet near Placerville, California, by Messrs. J. S. Barnes and W. C. Cumming of the Institute of Forest Genetics (then known as the Eddy Tree Breeding Station). The hand-pollinated cones were harvested in the autumn of 1928, and the hybrid seeds from these cones were sown in a seedbed the following spring. Twenty-eight two-year-old seedlings from this cross were planted in a block at 15 by 15-foot intervals in the Eddy Arboretum. Adjacent to them were planted a few seedlings of the two parent species.

In February, 1932, a cold wave swept the Sierra foothills. Minimum air temperatures at 16.4° F. at four feet above the ground and 15.4° F. at ground level were recorded at the Institute weather station. Seedlings of the knobcone pine were not injured by this temperature; some foliage of the hybrids was lightly frosted; and all the Monterey pine seedlings were either killed or permanently deformed. Absence of permanent injury to the hybrids, at a temperature that was ruinous to one of the parent species, stimulated interest in their subsequent behavior. Later, in January, 1937, when the trees withstood a temperature of 11.8° F., their resistance to cold was further emphasized.